Wildlife Export Quota and Its Administrative System

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Abstract The authors discussed the administrative system of export quota and its method of calculation in the international wildlife trade. Three methods for determining wildlife export quota in China was put forward, based on the trend and status, domestic use, and historical export of wildlife resources. They include the single factor method, the double factor method, and the multiple factor method. In addition, the approaches and measures to establish and carry out the administrative system of wildlife export quota in China were discussed in this paper.
Key words: Export quota, International wildlife trade, Administrative system of wildlife export

Introduction

The administrative system of wildlife export quota means to impose a restriction on the export of wildlife and its products using scientific methods, so as to control and regulate export of wildlife, and protect and achieve sustainable use of wildlife resources. In general, the export quota is mainly applied for staple wildlife specimen in commercial trade. At present, this system has been adopted and positively advocated by CITES, and it requires that country members of CITES make restriction on the export of their specimen in order to protect wildlife species and enhance sustainable use of wildlife resources. The export quota of some specimen of specific species has been extensively discussed in the conferences of CITES country members. The administrative system of wildlife export quota has become one of the most effective measures to manage and control the international wildlife trade.

China is a developing country. With the deepening of economic reform and opening for the world, imports and export of wildlife increase extremely rapidly. Particularly, the export of species with large amount of commercial trade, involving more and more species and kinds of specimen, impose great pressure on conservation and use of wildlife resources in China. Although China has enacted hunting quota for some hunting animals, the administrative system of quota has not been extensively carried out in management and export of wildlife. As yet there is no systematic studies on the export quota of wildlife resource in China, including the scope of its application, its basis and calculation, and necessary corresponding measures etc. So it is very urgent to study the export quota of wildlife and build its administrative system as soon as possible. This will be of important significance for improving the administration of wildlife import and export in China, promoting the connection to international administration, and better carrying out laws and regulations, and international conventions concerned.

International Administrative System of Wildlife Export Quota And Its Application

Up till now, Conferences of CITES country members have enacted export quota on the trade of *Panthera pardus* skins, hunting specimen of *Acinonyx jubatns*, African Elephant ivory, and the species degraded from CITES Appendix I to II, respectively.

Trade of Leopard skins.

Leopard (*Panthera pardus*) is listed in CITES Appendix I and any commercial trade are prohibited. However, it is not listed as an endangered species in Botswana, Kenya, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe etc. These countries ask to export legal obtained skins. To effectively protect this species, but taking account of the interest of the

countries of origin in the meantime, Conference of CITES country members setup a trade quota of leopard skin (including hunting souvenir), and often check and revise it (Table 1).

Table 1. The annual export quota of leopard skin and hunting souvenir(unit: piece)*

Country	1994	1995	1996
Botswana	100	130	130
Central Africa Empire	40	40	40
Ethiopia	500	500	500
Kenya	80	80	80
Malawi	20	50	50
Mozambique	60	60	60
Namibia	100	100	100
South Africa	50	75	75
Tanzania	250	250	250
Zambia	300	300	300
Zimbabwe	500	500	500

*From the Secretary Department of CITES)

Table 1 shows that the annual export quota is very low. This quota is objectively determined on the basis of data of leopard concerned.

Trade of *Acinonyx jubatus* hunting specimen

Acinonyx jubatus is a species in CITES Appendix I. In order to effectively protect *Acinonyx jubatus* populations, Conference of CITES country members set up a quota system and permitted that Botswana, Namibia and Zimbabwe, etc. exported live specimen and hunting specimen. The relevant quota is 5, 150, 50 pieces, respectively.

Trade of Ivory

Conference of CITES country members (1989) decided to include all populations of African Elephant (*Loxodonta africana*) in Appendix I and forbid any commercial trade of them. Conference (1997) decided to degrade the populations in Botswana, Namibia and Zimbabwe to Appendix II and permits that these countries export ivory to Japan after 11 terms are meet. The population number and the quota of the three countries are showed in Table. 2.

Table 2. The elephant population number and export quota of the three south African countries*

Country	Wild population	Ivory in stock (kg)	Permited quota (kg)
Botswana	79,741~127,150	29,706	25,300
Namibia	7,684~14,220	51,200	13,800
Zimbabwe	66,000	29,279	20,000

*From CITES Doc. 10. 46, 1997)

When Conference of CITES country members discussed the application for demoting special African Elephant populations to Appendix II, three factors were emphatically considered. (1) status and trend of populations; (2) protective administrative measures and facing threats; (3) administrative effect of ivory trade (including the monitoring of illegal trade). Table 2 shows that the quota of these populations are far less than the amount of ivory in stock and also less than amount of ivory that the live populations can provide.

Trade of species degraded from CITES Appendix I to II.

In regard to some species in CITES Appendix I, if there are enough scientific evidences, which can prove that lowing their protective grade and making appropriate utilization will not result in the extinction of these species, Conference of CITES country members will permit its members to trade their wildlife resources and its products by making a quota. The quota is firstly applied to the export administration of *Crocodylus niloticus* and *Crocodylus porosus*. Trade quota of *Crocodylus niloticus* for Tanzania, Madagascar and Uganda are listed in Table 3, which are determined mainly in terms of the export data year by year.

Table 3. The export quota of *Crocodylus niloticus* (unit: piece) (from Conf. 6. 17)

Country	1995	1996	1997	1998	1999	2000
Tanzania	1,100	1,100	1,100	1,100	1,100	1,100
Madagascar	4,500*	5,000	5,000			
	200**	200	200			
Uganda	2,500	2,500	2,500			

* In captivity ** Wild

Now, the procedures that CITES makes the quota are as follow: The member firstly puts forward his export quota and reports to the Secretary Bureau of CITES by himself, or CITES Wildlife Committee or Conference determines the quota. Then, the Secretary Bureau circulates a notice to members for implementation. The members should report their next year export quota plan by the end of 1st, December, each year, after balanced. The quota will be published by the end of 1st, January next year. The quota keeping through two years can be continued to use hereafter. In addition, such corresponding measures as mark, permit, etc. should be carried out on special populations of species in CITES Appendix I.

Export quota of some countries

So far the Secretary Bureau of CITES has formally published export quota of 43 countries, concerning more than 150 species in total. The quota of most species in CITES Appendix II and III, among which,

are published unitarily by the Secretary Bureau of CITES on the basis of opinions of original countries. No detailed accounts concerning the biological grounds to determine the quota have been seen for the present. On the whole, the quota put forth is lower, only accounting for a little part of wildlife resources. The quota of some countries are summarized as follows.

Argentina has carried out export quota on some parrot ornamental birds since 1990. The quota are determined by national wildlife committee. Due to the lack of information concerning the status of wildlife resources, the main bases to make quota are historical trade data, which are revised according to the actual conditions each year. 90 per cent of the quota are distributed to the original managers, 10 per cent to the new managers. If the 10 per cent have not been used out, it will be distributed to the former again. The managers can exchange themselves quota each other.

Guiana has begun to establish his quota administrative system since 1987. National administrative department of wildlife resources is in charge of making quota. Under the lack of resource data, the quota is defined as the level of "not affecting the wild population of the species". National administrative department of wildlife resources distributes the quota to export managers within the national quota,.

Senegal set up his administrative system of wild bird export quota in 1982. The quota are made by national wildlife committee and then distributed to special managers.

Tanzania founded his quota system of species harvest at the beginning of 1980's. The quota are made by the CITES administrative office of national administrative department of wildlife. The main factors for making quota are the hunting and export data year by year.

On the 10th conference of CITES country members, Bangladesh handed over a motion for demoting the Bangladesh population of *Veramus flavescens* from CITES Appendix I to II. The suggestions attached to the Inventory Report are: "5 per cent can be used for commerce if the population is up to 1,000,000 in our country". This is an example that biologists determine the quota by the resource reserve of species.

China have made hunting quota of more than ten international hunting animals such as *Ovis ammon*, *Budorcas taxicoior*, *Capra ibex*, *Pseudois mayaur*, *Cervus elaphus macneilli* etc. These quota are distributed to provinces concerned by Ministry of Forestry, P. R. China each year. Because the hunting specimen are all exported, so these hunting quota can be considered as export quota, but they have not been put on records in Secretary Bureau of CITES.

Determination of Wildlife Export Quota

Main factors

Analyses on the international administrative system of wildlife trade quota shows that wildlife resource status, trade amount year by year, and administrative experience and requirements, are the main reference factors to determine export quota. The three factors should be considered synthetically in practice. In these factors, the detailed data of populations, and export of species or populations are more important to determine the export quota of species with large amount of trade.

In practice, the utilization of wildlife resource includes two aspects in China: export (including commercial and non-commercial export) and domestic utilization (including domestic trade). Wildlife resources are mainly used as materials of production, food, medicine and research etc. domestically and the amount is very large. So it should be considered as an important factor for export quota. This paper mainly emphasized three factors below in determining the export quota of China.

(1) status and trend of wildlife resource
(2) domestic utilization
(3) export data year by year

In addition, illegal trade and other factors are also considered.

The calculation of the export quota

Because comprehensive inventory and monitoring of wildlife resources was conducted so late in China, the data of wildlife resources and domestic utilization are rather few. It is very difficult to collect necessary data to determine the export quota in a short time. In practical management, the data we collected for each species are extremely different. Thus, in this paper, we put forward three methods (single factor-quota, double factor-quota, and multiple factor-quota) to determine the export quota of wildlife in China.

Single factor-quota Determination of single factor-quota is just based on the export data year by year. It includes the average method and smoothing exponent method.

(1) The average method

If the export data of wildlife and its products year by year are known, the export quota can be calculated with the following formula.

$$L = \bar{X} \pm \Delta X \qquad (1)$$

$$\bar{X} = \frac{1}{n}\sum X_i$$

$$\Delta X = \frac{ts}{\sqrt{n-1}}$$

Where:

L----export quota

$\overline{X}$ ----annual mean export amount

ΔX ---error

s----standard deviation

t----coefficient

Considering the habitat size, environmental quality and influence of human activity, the formula can be revised as:

$$L = (\overline{X} \pm \Delta X) \times K \tag{2}$$

Where: *K* is the coefficient of environment change .

(2) The smoothing exponent method

The smoothing exponent method is based on historical data of wildlife export. The export quota was calculated using the smoothing coefficient. This method assumes that the relation between future export quota and former export amounts is as follow: the more recent the export data are , the greater influence they have on the future quota, and vice versa. This method is the advanced form of the average method.

i.) Model of linear smoothing exponent

Model of linear smoothing exponent is as follows.

$$S_t^{(1)} = \alpha \sum_{k=0}^{t-1} (1-\alpha)^k X_{t-k} + (1-\alpha)^t S_0^{(1)} \tag{1}$$

Where:

α--smoothing coefficient (0>α>1) ;

X_{t-k}---export amount of year *t-k* ;

k--number of year

If the actual export amount of year t is known, the export quota of year t+1 can be calculated by following formula.

$$S_{t+1}^{(1)} = S_t^{(1)} + \alpha(X_t - S_t^{(1)}) \tag{2}$$

ii.) Model of quadratic smoothing exponent

Model of quadratic smoothing exponent is deduced from Model of linear smoothing exponent. It is applied to calculate the export quota when the data of export year by year change linearly. The formula is as follows.

$$S^{(2)} = \alpha S_t^{(1)} + (1-\alpha) S_{t-1}^{(2)} \tag{3}$$

where:

$S^{(2)}$---- quadratic smoothing exponent value of year t

α----weighted coefficient;

$S_{t-1}^{(2)}$----quadratic smoothing exponent value of year t-1.

If the present year is year t, the export quota of year T+t is:

$$\hat{X}_{t+T} = a_t + b_t T \tag{4}$$

$$a_t = 2S_t^{(t)} + S_t^{(2)} \tag{5}$$

$$b_t = \frac{\alpha}{1-\alpha}(S_t^{(1)} - S_t^{(2)}) \tag{6}$$

Where:

$\hat{X}_{t+T}$---export quota of year T+t

a_t, b_t----smoothing coefficient

t----the present year

iii.) Model of cubic smoothing exponent

Model of cubic smoothing exponent is applied to calculate the export quota when the export data change as a curve. Model of quadratic smoothing exponent is a special case of model of cubic smoothing exponent when the curvature is zero.

$$S_t^{(3)} = \alpha S_t^{(2)} + (1-\alpha) S_{t-1}^{(3)} \tag{7}$$

$$\hat{X}_{t+T} = a_t + b_t T + c_t T^2 \tag{8}$$

C_t is the smoothing coefficient. The meaning of other variables and parameters is same as that in model of quadratic smoothing exponent.

iv.) Estimation of initial value

Initial values etc. need to be calculated when determining export quota with model of smoothing exponent. Initial values have little influence on the result if the export data have been accumulated for more than 20 years. The initial values can be replaced with actual value X_t. If the years is less than 20 years, the initial values can be calculated by following methods.

For model of linear smoothing exponent, the initial value may be obtained from the average of the former values, for example, the mean of the values of former 4 to 5 years

The initial values can be calculated by the following formula in the model of quadratic smoothing exponent.

$$S_0^{(1)} = \tilde{a}_t - \frac{\alpha(1-\alpha)}{\alpha}\tilde{b}_t \tag{9}$$

$$S_0^{(2)} = \tilde{a}_t - \frac{\alpha(1-\alpha)}{\alpha}\tilde{b}_t \tag{10}$$

The initial values can be calculated by the following formula in the model of cubic smoothing exponent.

$$S_0^{(1)} = \hat{a}_t - \frac{\alpha(1-\alpha)}{\alpha}\hat{b}_t + \frac{(1-\alpha)(2-\alpha)}{\alpha^2} \times \hat{C}_t \quad (11)$$

$$S_0^{(2)} = \hat{a}_t - \frac{\alpha(1-\alpha)}{\alpha}\hat{b}_t + \frac{2(1-\alpha)(3-2\alpha)}{\alpha^2} \times \hat{C}_t \quad (12)$$

$$S_0^{(3)} = \hat{a}_t - \frac{3(1-\alpha)}{\alpha}\hat{b} + \frac{3(1-\alpha)(4-3\alpha)}{\alpha^2} \quad (13)$$

v.) Selection of smoothing coefficient

It is also important to select an accurate smoothing coefficient value when the export quota are determined using the method of smoothing exponent. In general, smoothing coefficient can be selected from 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6. Following principles should be considered in practice.

If high precision of $S_t^{(1)}$ is not required, a large value of the smoothing coefficient should be selected.

A small value (generally 0.05-0.20) of smoothing coefficient should be selected if the data appear to change irregularly.

A large value should be selected if the data change dramatically.

A small value (generally 0.1-0.4) should be selected if the data change smoothly.

The calculated export quota may be corrected according to recent changes of wild resources, domestic utilization and illegal trade etc. in practice.

The double factor-quota The double factor-quota is based on export data year by year and wildlife resource.

When it appears a linear relation between the changes of wildlife resource and export amount, the export may be supposed as the key factor to result in the change of wild resources. That is to say, wildlife resources (W) appear as a linear regression equation with export amount (X).

$$W = a + bX \quad (1)$$

With the data of wildlife resources and historical data of export the linear regression equation above can be obtained.

Export quota (L) can be calculated by the following formula.

$$L = rW \quad (2)$$

in which:

$$r = \frac{\bar{X}}{\bar{W}}, \quad \bar{X} = \frac{1}{n}\sum X_t, \quad \bar{W} = \frac{1}{n} \times \frac{\bar{X}}{\bar{W}}(1+b)$$

where;

$\bar{X}$ ----mean export amount over the years

$\bar{W}$ ---mean population of over the years

When there exits a linear relation between the changes of wildlife resource and the export amount, the export quota (L) can be calculated by the following formula:

$$L = W \times \frac{\bar{X}}{\bar{W}}(1+b) \quad (3)$$

where:

L---export quota

W--wildlife population

b -- slope

The multiple factor-quota The multiple factor-quota is based on wildlife resources, export amount year by year, and domestic utilization. Export quota may be calculated by the same method as determination of the wildlife hunting harvest.

$$L = (W - U) \times T$$

where:

L ----export quota

W ----annual utility available

U ----annual domestic utilization

T ----modifying coefficient(%) .

$W = Q \times r$ ($Q - W > R$, selecting 10 % or other for r)

or

$W = B \times r$ (selecting 60% or other for r)

where:

W--annual utility available;

Q ---- wildlife resources reserve;

R ----basic wildlife reserve;

r ---- utility rate available;

The modification of coefficient T should consider former annual export amount (X), illegal trade amount (I), and other factors. If (W-U) is far larger than (X+I), the export quota (L) should be revised with T so as to make (W-U) nearly to (X-I) or less than (X-I) (nearly to X). That is to say, the former normal annual export amount (X) may be regarded as the export quota (L). In practice, the export quota determined are usually lower because of the less X, which is advantageous to protect and enhance sustainable use of wildlife resources.

Application of models

The export quota of *Elaphe carinata* is calculated by methods above. Because there are only export data of *Elaphe carinata* of recent years and the data of resources and domestic utilization are both not available (the preliminary statistical number of inventory in main distributing area at the beginning of 1990s is 7,555,229, about 5,341,548 kg), the export quota is calculated only by the single factor-quota method.

Table 6. Export data of *Elaphe carinata* in recent years

Year	Live(piece)	Skin(piece)	Total
1988	150	6000.00	6150.00
1990	16621	520008.00	536629.00
1991	32250	531870.00	564120.00
1992	18640	363000.00	381640.00
1994	4440	94700.00	99140.00
1995	1750	80500.00	82250.00
1996	2000	165650.00	167650.00

Method 1: the average method

$$\Delta X = \frac{ts}{\sqrt{n-1}}$$

$$\overline{X} = \frac{1}{n}\sum_{1981}^{1996} X_t$$

$$\Delta X = \frac{t_{0.05} \times s}{\sqrt{n-1}} = 2.447 \times \frac{211861.4}{\sqrt{6}} = 211646.1$$

$$L = \overline{X} \pm \Delta X = 262511.3 \ (211646.1$$

The result should be corrected by the formular, $L = (\overline{X} \pm \Delta X) \times k$. k should be selected carefully according to the status of wildlife resources in practice.

Method 2: the smoothing exponent method

$$S_t^{(1)} = \alpha \sum_{k=0}^{t-1} (1-\alpha)^k \times X_{t-k} + (1-\alpha)^t S_0^{(1)}$$

The mean of the former data was used as the initial values, 0.1 as the smoothing coefficient. Then, the export quota in 1997 is:

$S_t^{(1)}$ =160,684.9

This result is very close to the export quota of 1996. If the selected smoothing coefficient is a little larger, the result will be relatively lower.

The results above show that the mean annual export was 270,000 over the past seven years by the average method. The export quota is about 160,000 in 1997 by the smoothing exponent method, which is less than the mean export year by year, accounting for about 2 per cent of the total resource reserve. In practice, the quota should be revised according to the domestic utilization, illegal trade, destruction to the resources and habitats of snake by human etc.

Suggestions on Establishing the Administrative System of Wildlife Export Quota in China

The administrative system of wildlife export quota must be guaranteed with strong and powerful laws and administrative measures. The following aspects should be paid more attention in establishing and performing this system in the near future.

Scope of its application

According to the reality of China, the administrative system should be emphatically applied to those wildlife specimen whose fundamental aim is to make profits, having large amount of export, and greater influence on wildlife resource. Also, the quota should be applied to specimen of CITES Appendix species, national key species for protection, non-CITES and non-protective species with large amount of export. The system generally is not suitable to those specimen in captivity.

Procedures of report and approval of the quota

In the case of China, suggestions on the procedures of report and approval are as follows.

Report and approval For the special populations of species listed in CITES Appendix I and II, the provincial administrative department in charge of wildlife puts forth his provincial export amount in principle. When quota were reported to the national administrative department in charge of wildlife and CITES office of China, the national department will organize the committee of evaluation or entrusts Endangered Species Scientific Committee P.R.C to determine the export quota. CITES office of China reports these quota to CITES for approval. Then the approved quota will be published by the national administrative department in charge of wildlife or CITES office of China. The national administrative department in charge of wildlife and CITES office of China will examine and approve export of some wildlife according to its approved quota. This kind of condition is fit for export of special species and their products such as *Alligator sinensis* and *Felis bengalensis*, etc..

For the other species in CITES Appendix II, III, and national key species for protection, the provincial administrative department in charge of wildlife puts forth his provincial export plan. After determined by national administrative department in charge of wildlife and CITES office of China, the export quota are announced for performance. In the meantime, the export quota must be reported to the Secretary Bureau of CITES for records and publication to all country members.

In regard to the non-CITES Appendix and non-key protective species, the provincial administrative department in charge of wildlife puts forth his export plan. The national administrative department in charge of wildlife and CITES office of China enact and publish the export quota.

In order to prevent utilizing the wildlife resources intensively in the same province, no permit are given to provinces to exchange quota each other. It must be approved by the provincial administrative department in charge of wildlife to exchange surplus quota between the managers of the same province.

Relevant data Provincial department must append the status of resources, administration and illegal trade of the species in his province when reporting export quota plan.

Time Provincial department should report his next year export plan by the end of 1st, December every year. National administrative department in charge of wildlife approves and publishes the export quota of provinces by the end of 1st, January annually.

Deadline of the export quota The effective period for the quota is one year. Referring to the way of CITES, the quota keeping constant throughout two years can be used continually hereafter.

Necessary measures

Marking Marking system of wildlife and its products is an important necessary measure for the administrative system of wildlife export quota. Corresponding marking measures must be made on special species of CITES Appendix I and II. However, this is not necessary for other species in general.

Licenses and Certificate In the light of the regulations of China, a corresponding "CITES License" must be handled for CITES Appendix species and "non-CITES License" for non-CITES species.

Monitoring In order to make more scientific and accurate estimation of the quota, national department in charge of wildlife, CITES office of China and Endangered Species Scientific Committee, P.R.C should set up perfect monitoring system with modern science and technology. The monitoring work include the wild populations and their dynamics, populations in captivity and their dynamics, domestic utilization, illegal export and stock etc.

Port control Ports, customs, departments of quarantine for fauna and flora and departments of commodity inspection etc. should establish and strengthen corresponding administrative measures and technology. In order to increasingly promote the effect of the export quota, they should strictly check and ratify the export amount and mark status etc., and feedback the actual export to administrative departments concerned.

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